THE CCU CORNER

# Eliminating Central Venous Catheter Infections

BY GEORGE PHILIPPIDES, M.D., AND ERIC AWTRY, M.D.

## The Problem

Each year, 18 million patient-days are spent in critical care units. For half of these days, a central venous catheter (CVC) is in place for hemodynamic monitoring and delivery of medications and nutrition. More than 15% of patients who receive CVCs suffer an adverse event, including mechanical complications, in 5%-19% of patients; thrombotic complications (2%-26%); and infectious complications (26%).

CVCs also cause bloodstream infections (BSIs), resulting in death and prolonged hospitalization.

In August, the Centers for Medicare and Medicaid Services (CMS) ruled Medicare will no longer pay for preventable inpatient infections, including those resulting from vascular catheterization (see related story, page 4).

Reducing the number of CVC-related infections is therefore more important than ever, and poses several challenges.

First, it is difficult to properly educate, train, and supervise each of the many house officers who rotate through the CCU every 2-4 weeks. Many trainees still acquire skills via the old "see one, do one, teach one" tradition.

Furthermore, few programs have a system for assessing and documenting proficiency or specific rules governing proper physician oversight and RN support during the procedure.

## The Guidelines

The Centers for Disease Control and Prevention has developed evidence-based Guidelines for the Prevention of Intravascular Catheter Related Infections (the guidelines are available at www.cdc.gov/mmwr/preview/mmwrhtml/rr5110a1.htm). Some of the key recommendations include:

► **Insertion site.** Subclavian catheters are associated with lower BSI rates than are either internal jugular or femoral catheters.

► **Sterile barrier.** The use of a mask, cap, sterile gown, sterile gloves, and large sterile drape cuts infection rates.

► **Daily review of line.** Infection rates increase over time.

► **Skin antisepsis.** Site preparation with 2% chlorhexidine solution lowers infection rates, compared with povidone iodine or 70% alcohol.

► **Quality assurance and continuous education.** Infection risk declines following standardization of care, and increases when catheter insertion and maintenance is performed by inexperienced, poorly trained staff.

Several trials have shown that adherence to these guidelines dramatically reduces CVC-related infections.

At Johns Hopkins Hospital, Baltimore, a quality improvement team implemented five interventions—staff education, creation of a catheter insertion cart, daily review of CVC need, implementation of a guideline/checklist, and empowerment of nurses to stop the CVC insertion if a violation of the guidelines was observed.

This change resulted in a drop in CVC-related bacteremias from 11.3 to 0 per 1,000 catheter-days, and prevented 43 CVC-related infections, eight deaths, and almost $2 million in estimated additional costs per year.

A similar intervention trial that was performed in 108 ICUs in Michigan and included more than 375,000 catheter-days showed a drop in CVC infections of 66% 18 months after implementation.

## The Future

The BMC Central Line Project will be implemented in our intensive care units within the next few months. In addition, we are considering forming a procedure consult team to be staffed by a cardiology or critical care attending physician and rotating medical house officers who can be called to place a CVC in any patient in the hospital. This team will spearhead the dissemination of evidence-based guidelines, provide instruction and supervision during CVC placement, and offer instruction on the use of a portable ultrasound in an effort to offer excellent care to our patients and excellent training to our house officers.

We will share the results of our intervention project early next year.

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### The Intervention

At Boston Medical Center, we are embarking on a multidisciplinary approach to reduce CVC-related bloodstream infections in the CCU. The main components of this Central Line Project are to:

► **Implement a standardized education program.** All house officers will be required—and CCU nurses will be encouraged—to take a Web-based examination before they are allowed to place CVCs.

► **Document competency.** Results of exams will be kept on the CCU Web site so credentialed house officers can be identified.

► **Improve supervision.** Each house officer rotating through the CCU will initially be supervised by the cardiology fellow or attending physician during catheter insertion until the skill is mastered.

► **Implement a bedside procedure checklist.** We created a two-part electronic order set/check list that will serve as a "prompt" toward better compliance with the guidelines and will allow for easy data collection. Part 1, to be filled out preprocedure by the bedside RN and physician, will ensure that consent/timeout was attained, anticoagulation status is appropriate, subclavian line was considered, and all items necessary for proper sterile technique were present. Part 2, completed post procedure, documents complications and violations in protocol; electronic orders are immediately placed for proper line care and surveillance and to ensure that an x-ray is performed.

► **Empower nurses.** RN involvement is now mandatory during all CVC procedures. CCU nurses will be empowered to stop the procedure if violations are observed, and to document such events on the checklist.

► **Monitor catheters after insertion.** The CCU teams will review the need for the CVC daily. Patients with CVCs will be electronically tracked. Those who develop a fever or leukocytosis will be seen by a team of infection control nurses who will reassess the line and decide on the need for blood cultures, antibiotics, and line removal.

### TALK BACK

**How are you tackling the problem of CVC infections in your coronary care unit?**

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# Daily Breathing Protocol Reduced Time Patients Spent in ICU

BY ROBERT FINN
*San Francisco Bureau*

SAN FRANCISCO — Intensive care unit patients leave the hospital more than 4 days early if they receive spontaneous awakening and breathing trials every day, Dr. E. Wesley Ely said at the International Conference of the American Thoracic Society.

The multicenter, controlled ABC (awakening, breathing, controlled) trial involved 335 patients randomized to either standard goal-directed sedation or the awakening, breathing approach.

Compared with controls, the ABC trial patients left the ICU an average of 3.8 days sooner (9.1 days vs. 12.9 days), were discharged from the hospital 4.4 days sooner (14.8 days vs. 19.2 days), and spent 3.1 more days alive and off the ventilator (14.7 days vs. 11.6 days). There was no significant difference in the percentage of patients who survived for 28 days or more (72% for the ABC patients, 65% for controls).

"You can save somewhere in the neighborhood of $5,000-$15,000 per patient via protocols like this," said Dr. Ely of Vanderbilt University, Nashville, Tenn.

Earlier studies demonstrated daily breathing trials improved the outcomes of ventilated patients, and daily lifting of medically induced comas improved the outcomes of critical care patients. This was the first trial to put both of those protocols together.

"For years we have not optimized the removal of those sedatives, analgesics, and the ventilator. Instead, we allow the patients on average to probably get 2 or 3 days of additional unnecessary time on the ventilator, all the while being exposed to these high doses of very potent psychoactive drugs,"Dr. Ely said. "On average patients receive too long of a duration and too high of a dose of these medicines, and while it's well intentioned,. . . I think we're overshooting. People generally think of these drugs as not harmful, but we're actually finding that ICU delirium, which is a result of these drugs, is a very important predictor of death."

The ABC trial protocol is easy to implement, Dr. Ely said. All it takes is the will to make the change among the providers who manage patients in the ICU.

About half the patients enrolled in the trial had sepsis or acute respiratory distress syndrome. Other common diagnoses were myocardial infarction/congestive heart failure, chronic obstructive pulmonary disease/asthma, and altered mental status. Surgical ICU patients were excluded because the investigators did not want to discontinue analgesia in patients with incisions.

Dr. Ely emphasized patients under the ABC trial protocol must be watched closely. "A very important point here is that we did not sacrifice patient comfort," he said. If patients exhibited signs of distress such as rapid breathing or sweating, sedation and analgesia were resumed, beginning at half the previous dose. ■